

10 **Offenlegungsschrift** 1613011

21 File reference P 16 13 011.3 (B 92865)

22 Date of application: June 3, 1967

43 Date laid open: October 8, 1970

Exhibition priority: -

30 Convention priority: -

32 Date: -

33 Country: -

31 File reference -

54 Title Stator of a small motor with permanent-magnet excitation

61 Addition to: -

62 Elimination from: -

71 Applicant: Fried. Krupp GmbH, 4300 Essen

Representative -

72 Named as inventor: Krause, Harald, 4300 Essen

Notification in accordance to Art. 7 § 1 para. 2 No. 1 of the Act of
4.9.1967 (Official Federal Law Gazette I page 960): 5.27.1969

1613011

Beteiligungs- und Patentverwaltungsgesellschaft mit
beschränkter Haftung in Essen

5 Stator of a small motor with
permanent-magnet excitation

The invention relates to a stator of a small
motor with permanent-magnet excitation, the permanent-
magnet circuit of which comprises at least two
10 permanent-magnet segment shells and a return part of
soft iron surrounding these.

In a known stator of this kind, the return part
comprises two half-shells made of soft iron, the joints
between which are situated on the outside of the
15 segment shells, approximately at the centre of the
latter. These joints are unwanted in view of the
magnetic properties of the permanent-magnet circuit
because there is no return path in the region of the
joints. Another disadvantage of the known stator is
20 that, during the production of the half-shells of the
return part, it is necessary to exert pressure against
the segment shells from the outside while the stator is
being produced by encapsulation by means of moulding,
casting or the like. As a result, there are openings in
25 the outer casing of the stator caused by the dies which
press against the half-shells.

It is the object of the invention to avoid the
disadvantages as regards the properties of the
permanent-magnet circuit and to provide a stator
30 configuration which can be produced more simply and
more cheaply. In the case of a stator of the type
stated at the outset, the invention consists in that
the return part is designed as a single-layer wound
element of strip, wire or the like wound in a spiral.
35 This makes it possible to avoid joints on the outside
of the segment shells and to ensure that the wound
element itself holds the segment shells fast during the

009841/03

17-FEB-2000 16:40 FROM

TO

90012486410270 P.08

- 2 -

production of the sheath of the stator, thus making it possible to achieve sheathing with no gaps.

It is expedient if the wound element is wound with a pitch equal to the axial width of the strip, wire or the like: thus giving a wound element without gaps. The resilient properties of the material of the wound element allow adaptation to dimensional inaccuracies of the segment shells while the segment shells are being held fast.

To produce a stator according to the invention, it is advantageous to employ a method in which the segment shells are placed on a central mandrel, the wound element wound from the strip, wire or the like of relatively small diameter cut to length is pushed over the segment shells, the permanent-magnet circuit thus formed is encapsulated by casting or moulding with a non-magnetizable material, and the central mandrel is then removed. This method offers a simple means of producing a stator in which the inside diameter, which is determined by the central mandrel, can be maintained extremely accurately without regard to dimensional inaccuracies of the segment shells. In this context, it is expedient to use a strip, wire or the like, bevelled at both ends with an angle equal to the slope, of a length such that the axial length of the wound element is made at least equal to the axial length of the segment shells. This is achieved by choosing a length of strip, wire or the like such that the strip, wire or the like gives a wound element of sufficient axial length even at the maximum outside diameter of the segment shells which occurs.

Finally, it is possible, in the method for the production of the stator according to the invention, to determine the external shape of the sheath of the stator by means of a corresponding casting or injection-moulding die. During the casting or moulding of the non-magnetizable material of the sheath, it is

- 3 -

possible for the foot of the stator to be produced and/or a rotor bearing to be fixed simultaneously.

An exemplary embodiment of the invention is illustrated in the drawing, in which:

- 5 Fig. 1 shows a finished stator in perspective view,
Fig. 2 shows a segment shell in perspective view and
Fig. 3 shows a wound element in elevation.

The magnetic circuit comprises the segment shells 1 and the wound element 2 produced from a strip.

- 10 These parts are arranged in the sheath 3 of the stator, the said sheath being provided with a foot 4. In Fig. 1, part of the sheath 3 is broken away to illustrate the position of the wound element 2 more clearly.

- 4 -

1613011

Patent Claims

1. Stator of a small motor with permanent-magnet
5 excitation, the permanent-magnet circuit of which
comprises at least two permanent-magnet segment shells
and a return part of soft iron surrounding these,
characterized in that the return part is designed as a
single-layer wound element (2) of strip, wire or the
10 like wound in a spiral.
2. Stator according to Claim 1, characterized in
that the wound element (2) is wound with a pitch equal
to the axial width of the strip, wire or the like.
3. Stator according to Claim 1 or 2, characterized
15 in that the wound element (2) is composed of a material
with resilient properties.
4. Method for the production of a stator according
to one of the preceding claims, characterized in that
the segment shells (1) are placed on a central mandrel,
20 the wound element (2) wound from the strip, wire or the
like of relatively small diameter cut to length is
pushed over the segment shells (1), the
permanent-magnet circuit thus formed is encapsulated by
casting or moulding with a non-magnetizable
25 material (3), and the central mandrel is then removed.
5. Method according to Claim 4, characterized by
the use of a strip, wire or the like, bevelled at both
ends with an angle equal to the slope, of a length such
that the axial length of the wound element (2) is made
30 at least equal to the axial length of the segment
shells (1).
6. Method according to Claim 4 or 5, characterized
in that, during the casting or moulding of the non-
magnetizable material, the foot (4) of the stator is
35 produced and/or a rotor bearing fixed simultaneously.

009841/03

FEB 15 2000 10:37AM

188D PATENT HARRY WILLIAM

NO.866

P.3 P.02

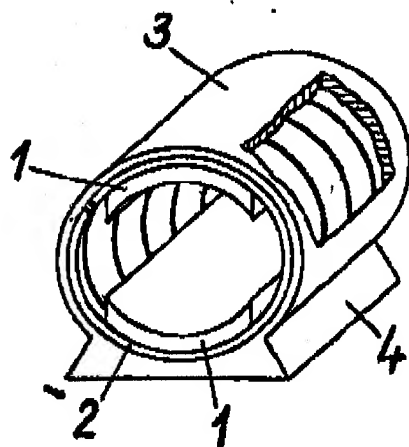


FIG. 1

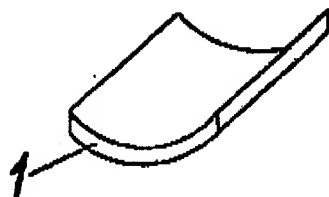


FIG. 2

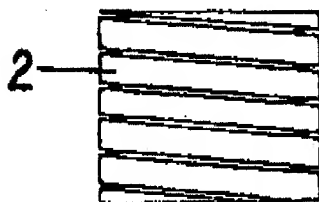


FIG. 3

OLS 1613011
009841/0324

FEB FEB. 15. 2000 10:38AM

1 B&D PATENT HARRY WILLIAM

NO. 866

P. 5

Patentanansprüche

1613011

1. Stator eines dauermagnetisch erregten Kleinmotors, dessen dauermagnetischer Kreis aus mindestens zwei dauermagnetischen Segmentschalen und einem diese umschließenden Rückschlußteil aus Weicheisen besteht, dadurch gekennzeichnet, daß der Rückschlußteil als einlagiger Wickelkörper (2) aus spiralförmig gewickeltem Band, Draht o. dgl. ausgebildet ist.

2. Stator nach Anspruch 1, dadurch gekennzeichnet, daß der Wickelkörper (2) mit einer der axialen Breite des Bandes, Drahtes o. dgl. gleichen Ganghöhe gewickelt ist.

3. Stator nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Wickelkörper (2) aus einem Werkstoff mit federelastischen Eigenschaften besteht.

4. Verfahren zum Herstellen eines Stators nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Segmentschalen (1) auf einen Zentraldorn aufgelegt, über die Segmentschalen (1) der aus dem abgelängten Band, Draht o. dgl. mit kleinerem Durchmesser gewickelte Wickelkörper (2) geschoben, der so gebildete dauermagnetische Kreis mit einem nicht magnetisierbaren Werkstoff (3) umgossen oder umspritzt und dann der Zentraldorn entfernt wird.

5. Verfahren nach Anspruch 4, gekennzeichnet durch die Verwendung eines an beiden Enden mit einem der Steigung gleichen Winkel abgeschrägten Bandes, Drahtes o. dgl. von solcher Länge, daß die axiale Länge des Wickelkörpers (2) mindestens gleich der axialen Länge der Segmentschalen (1) wird.

6. Verfahren nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß beim Gießen oder Spritzen des nicht magnetisierbaren Werkstoffs (3) gleichzeitig der Fuß (4) des Stators hergestellt und/oder ein Rotorlager befestigt wird.

KV 74/67
No/Wg.

- 4 -

009841/0394

1969

3/70

In der Zeichnung ist ein Ausführungsbeispiel der Erfindung dargestellt, und zwar zeigt

Fig. 1 einen fertigen Stator in perspektivischer Ansicht,
Fig. 2 eine Segmentschale in perspektivischer Ansicht und
Fig. 3 einen Wickelkörper in Ansicht.

Der magnetische Kreis besteht aus den Segmentschalen 1 und dem aus einem Band hergestellten Wickelkörper 2. Diese Teile sind in der Ummantelung 3 des Stators angeordnet, die mit einem Fuß 4 versehen ist. In Fig. 1 ist zur Verdeutlichung der Lage des Wickelkörpers 2 ein Teil der Ummantelung 3 weggebrochen.